Systems & Accessories

- Light Source
- Sample Chambers
- Stepping Motor Controller
- Detector
- Variable Wavelength Fiber Optics Modules
- Tunable Light Sources

For Applications In:
Analytical Chemistry
Physics
Life Sciences
Engineering
Communications

Optometrics Corporation
Wavelength Selection Solutions

Optometrics Corporation has, for more than forty years, designed and manufactured optical components and instruments for university, industrial and government laboratories and the OEM markets.

Optometrics Corp. has manufactured over 20,000 Mini-Chrom monochromators since their initial introduction in 1978. The majority have been incorporated into a variety of analytical and biomedical instruments made and marketed by leaders in their respective fields.

For those customers wishing to configure their own optical systems built around or to equip their laboratory with modules that work with the popular Mini-Chrom monochromator, Optometrics has designed compatible systems. These include a light source, sample chambers, stepping motor controller and detector. Customers can also choose selected modules to configure their own variable wavelength fiber optic modules or choose the turnkey Tunable Light Sources, all built around our line of Mini-Chrom monochromators.

Facilities

Optometrics' facility in Ayer, Massachusetts contains space for offices, engineering, R&D and production. Equipment that support our broad range of capabilities includes:

- Four metal vacuum coating systems;
- Three thin-film soft coated filter vacuum coating systems;
- Two Ion-Assisted Deposition hard coat vacuum coating systems;
- Three grating ruling engines;
- Production holographic laboratory;
- R&D holographic laboratory;
- Full replication and lamination facilities;
- Full assembly, alignment and test facilities;
- Full complement of test equipment for spectral testing from the UV to the Far Infrared, for mechanical and flatness testing, for humidity and environmental testing;
- Extensive marking, packaging and bar coding equipment and capabilities

Products

- **Gratings**
  Originals and Replicated, Ruled and Holographic; Grazing Incidence, Echelles, Telecom and Transmission Gratings

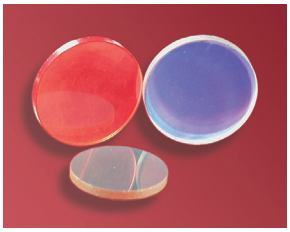
- **Beamsplitters**
  Reflecting/Transmitting Beamsplitters, Transmission Grating Beamsplitters, Beam Dividers/Combiners

- **Optical Components**
  Mirrors, Lenses, Windows, Flats, Beamsplitters, Prisms

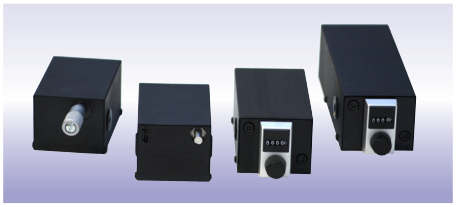
NEW

- **Filters**
  Soft Coated, Near Ultraviolet, Visible, Near Infrared, and Laser Line Filters

- **Infrared & Laser Products**
  Laser Gratings, Holographic and Ruled Wire Grid Polarizers



- **Monochromators**
  Mini-Chrom Monochromators



- **Systems & Accessories**
  Monochromatic Light Modules, Sample Compartments, Detectors, Light Sources, Modular Recording Spectrophotometers

- **SPF-290S Analyzer**
  Spectrophotometer for determining SPF Values

Plus specialized packaging, bar coding and Kanban stocking arrangements for OEM customers.

Goals

Optometrics goal is to provide advanced optical components and systems for use in wavelength selection applications in:

- Analytical Chemistry
- Life Sciences
- Telecom Applications
- Physics
- Education
- Space Sciences

and other applications where high quality optics are key.

In order to accomplish this, the Company has assembled state-of-the-art facilities and people to produce:

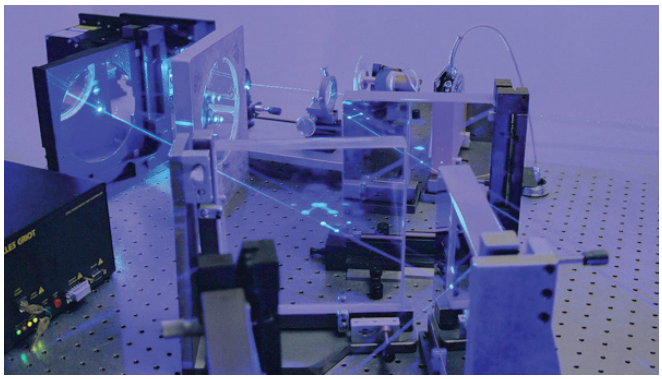
- diffraction gratings: ruled & holographic, original & replicated, reflection and transmission
- interference filters
- optical components
- laser gratings & products
- monochromators & accessories
- spectrophotometers
- wire grid polarizers: ruled & holographic

OEM Services

Optometrics caters, in particular, to the needs of its OEM customers by offering special services such as:

- Kanban stocking arrangements
- Custom packaging programs
- Bar coding capabilities
- Code names for complete confidentiality
- Higher level pre-aligned optical assemblies

The company is also proud of its ability to support customers in all phases of the product development cycle.



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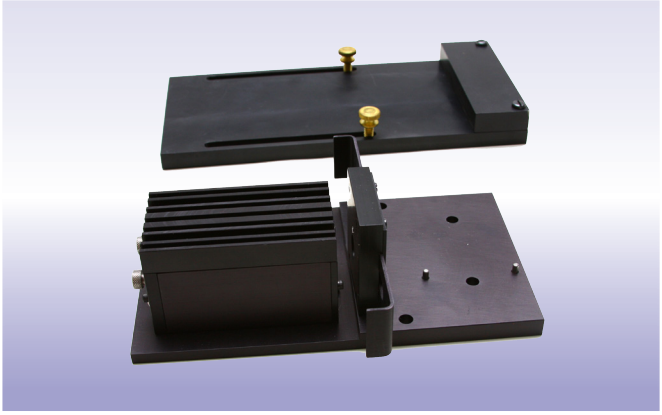
TUNGSTEN SOURCE MODULE

The Tungsten Source Module includes a 20W tungsten halogen lamp in a quartz envelope, a lamp housing, shutter assembly and variable aperture assembly on a base plate and a regulated 12V DC power supply. Halogen compounds in the lamp recycle tungsten deposited on the inside of the envelope back to the filament. This cycling of tungsten prevents the gradual degradation of the lamp output, particularly in the ultraviolet and increases the life of the lamp. The module can be used as a visible and near infrared source (340 nm to 3 µ) or as a building block to construct a variety of spectrophotometric systems. The module has provisions for attaching a Mini-Chrom monochromator and/or an adapter plate*. The addition of a Mini-Chrom converts the Tungsten Source Module to a compact and versatile monochromatic light source. A quartz lens in the lamp housing focuses radiation from the tungsten lamp onto the entrance slit of the Mini-Chrom, obviating the need for additional optics and time consuming alignment. With an adapter plate, the module can be



easily attached to the Optometrics Sample Compartment (see page 5). A Silicon Detector (see page 9) can then be added, resulting in a manual spectrophotometer or fluorometer. Overall dimensions in mm: 203 x 114 x 62; Weight 0.9 Kg (2.0 lbs).

* *See Optometrics' Monochromators brochure for details on models available.*

SPECIFICATIONS

Lamp Power Supply:
Line regulation 0.1%
Load regulation 1%
Ripple ..... 1 mV RMS Max.
Input Voltages ..... 105-126V AC, 60 Hz
210-252V AC, 50 Hz
Output ..... 12V DC/ 2 A
(3 A start-up surge)
Internal overcurrent protection provided.

Lamp:
Type ..... Tungsten Halogen in quartz envelope
Power ..... 20 W
Color temperature ..... 3200° K
Nominal life ..... 500 hours
Spectral output ..... 340 nm - 3 µ
Connector ..... G-4 plug-in

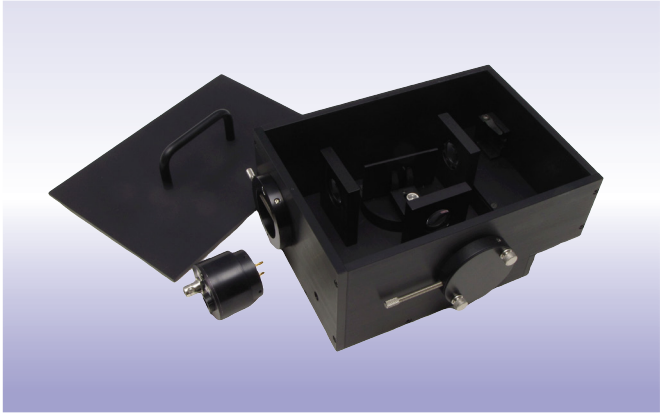
CATALOG NO.	TUNGSTEN SOURCE MODULE
7-1110	Tungsten Source Module with Regulated power supply for 105-125V AC.
7-1125	Tungsten Source Module with Regulated power supply for 210-225V AC.
7-1130	Adapter plate for attaching Tungsten Source Module to Sample Compartment.
7-1120	20W Tungsten Halogen lamp replacements (package of two).

SAMPLE COMPARTMENT

The versatile Optometrics Sample Compartment accepts standard 1 cm square cells or solid samples up to 50 x 50 x 10 mm. A quartz lens focuses incident radiation in the center of the cell or on the front surface of a solid sample depending on the position of the sample stage. Two additional quartz lenses focus transmitted, reflected or emitted radiation at the in-line or 90 degree detector ports. A filter holder, which accepts Optometrics' 25.4 mm diameter filters, is attached to the inside of each port.

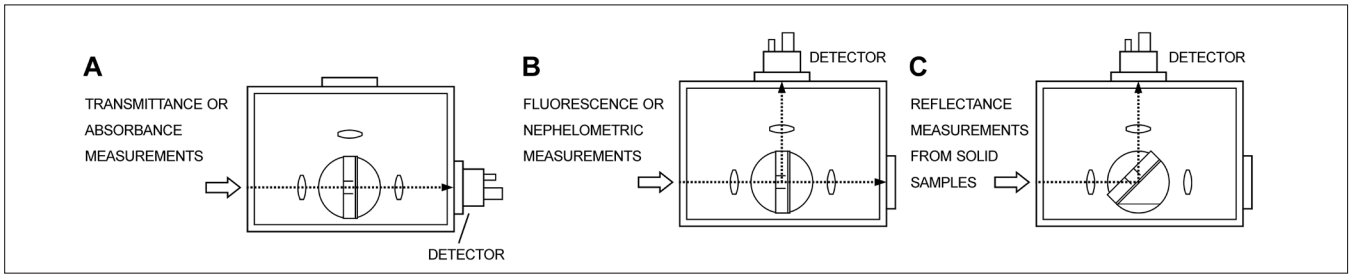
When measuring the percent transmittance or absorbance of a solution or a transparent solid sample, the sample stage and detector are positioned in-line. Fluorescence or nephelometric measurements are made with the detector positioned 90 degrees to the incident radiation. Reflectance measurements from solid samples require rotating the sample stage 45 degrees and placing the detector 90 degrees to the incident radiation (see Optical Path Configuration drawing below). Overall dimensions in mm: 218 x 168 x 92; Weight 2.5 Kg (5.4 lbs.)

* *See Optometrics' Monochromators brochure for details on models available.*



For information on a detector that plugs into the sample compartment, see page 9. If monochromatic radiation is required, our Tungsten Source Module (see page 4) and either a Digital or Scanning Digital Monochromator can be attached to the Sample Compartment with the Adapter Plate.

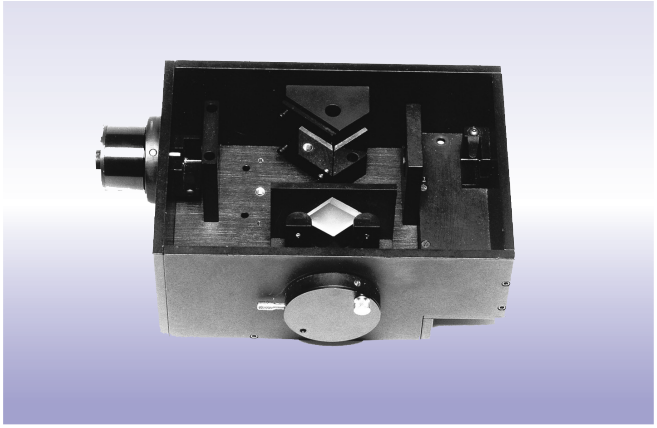
OPTICAL PATH CONFIGURATIONS



CATALOG NO.	SAMPLE COMPARTMENT
7-1200	Sample Compartment with three 1" focal length quartz lenses, three filter holders, two detector ports, rotary sample stage and sample holders.

SPECULAR REFLECTANCE SAMPLE COMPARTMENT

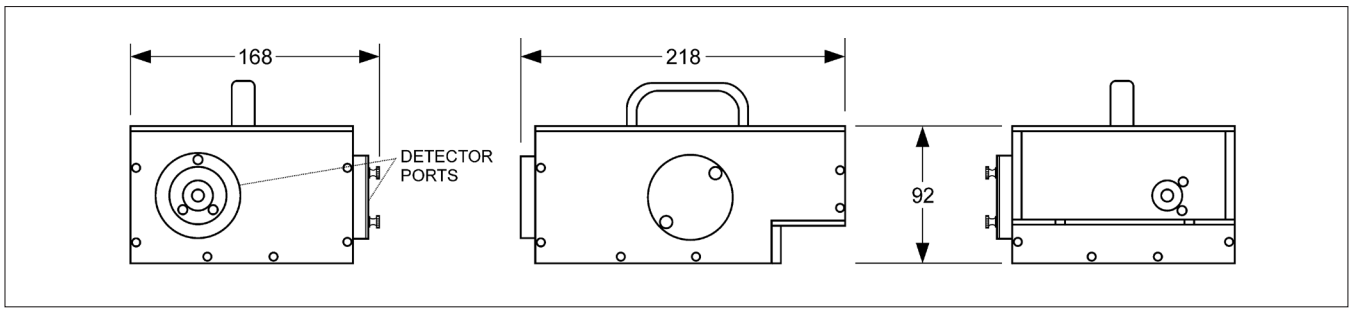
The Specular Reflectance Sample Compartment is designed to measure the reflectance of solid samples such as mirrors, paint samples, etc. It attaches to the exit port of an Optometrics Mini-Chrom monochromator* with the use of the Adapter Plate (see page 4). Monochromatic light from the exit slit of the monochromator is reflected onto the sample, which is held in position by a spring-loaded mount. The angle of incidence at the sample is 11 degrees. Light from the sample is reflected to a detector at the exit port. The unit is supplied with a mirror for making a reference measurement.



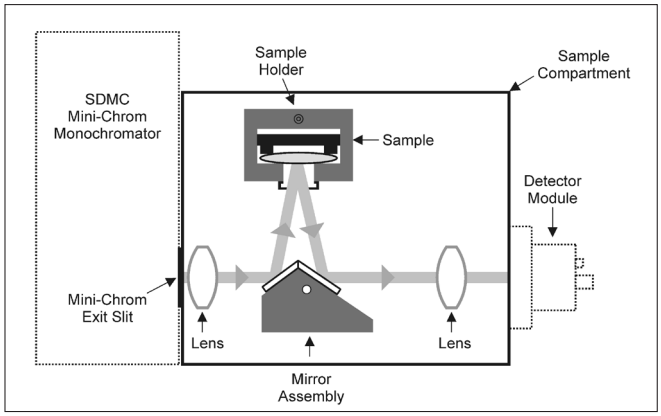
The standard Sample Compartment, (see page 5) measures samples at a 45 degree angle of incidence, whereas the Specular Reflectance Sample Compartment is designed for measurements requiring a smaller angle of incidence. Maximum sample size is 7 x 14 cm.

* *See Optometrics' Monochromators brochure for details on models available.*

OVERALL DIMENSIONS IN MILLIMETERS



SPECULAR REFLECTANCE SAMPLE COMPARTMENT



CATALOG NO.	SAMPLE COMPARTMENT
8-0050	Specular Reflectance Sample Compartment

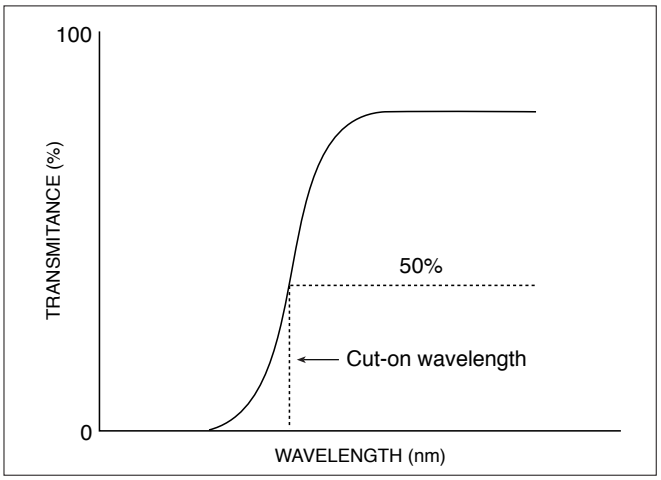
LONG PASS CUT-ON FILTERS

Long pass cut-on filters are used to prevent higher order radiation from the grating monochromator from entering the sample compartment. Optometrics' long pass cut-on filters are cored from selected color glasses which transmit radiation above and block radiation below a specified wavelength. The wavelength interval (transition interval) from blocking to maximum transmission is sharp, typically 25 to 35 nm. Long pass cut-on filters are identified by a cut-on wavelength, i.e. the wavelength at 50% of maximum transmission.

Long pass cut-on filters have an average high transmission of 85% from 15 to 20 nm above their cut-on wavelength to 2000 nm. Attenuation of radiation below the cut-on wavelength is due to absorption of the colorants in the glass and the thickness of the glass. Superior blocking in Optometrics' filters (0.001%) is due to the use of 3 mm thick color glass.

Optometrics' long pass cut-on filters are all epoxied in a black metal ring for easy mounting and handling and are 25.4 mm dia. x 9.65 mm thick. The cut-on wavelength is marked on all filters. Designed to mount directly in the Optometrics' sample chamber (see page 5).

CUT-ON FILTER



GENERAL SPECIFICATIONS

Cut-on Wavelength .....± 5 nm
Blocking (Short wavelengths) 0.001%
Transmission ..... ≥ 85%
Transmission Range.....Cut-on to 2000 nm

Dimensions and Tolerances:
Diameter (Mounted) .....25.4 mm ± 0.25 mm
Thickness (Mounted).....9.65 mm ± 0.15 mm
Clear Aperture .....20.0 mm ± 0.25 mm

LONG PASS CUT-ON FILTERS

CATALOG NO.	MINI-CHROM MODEL NO.	CUT-ON λ
7-1201	01	375 nm
7-1202	02 & 03	420 nm
7-1204	04	630 nm
7-1205	05 & 06	1200 nm

Optometrics' long pass cut-on filters are all epoxied in a black metal ring for easy handling and mounting in our sample chamber and are 25.4 mm dia. x 9.65 mm thick. The cut-on wavelength is marked on all filters

STEPPING MOTOR CONTROLLER

The PCM-02 is ideally suited for driving the Optometrics line of Scanning Digital Monochromators*.

Using a computer, the operator can move the monochromator to a specific wavelength and scan over a wavelength range. The PCM-02 application program can be used with Windows® operating systems.

When a terminal is used to drive the monochromator, the user can access over 25 commands that control a variety of operations of the grating drive (e.g. including the distance to be moved, the initial and final velocities of the move, the acceleration, the time period for pauses, etc.). Commands can be sent at any time, even when the motor is operating. The motor controller board includes over 2,000 bytes of non-volatile memory to store complex motion control programs.

** See Optometrics' Monochromators brochure for details on models available.*

Six different Scanning Digital Monochromators are available for use with the PCM-02. Each monochromator is fitted with a pair of entrance and exit slits specified by the user. Additional slits can be ordered separately*.

® Windows is a registered trademark of Microsoft.

GENERAL SPECIFICATIONS

Motor Drive:
- Type ..... Bi-polar
- No. of phases 2
- Step Modes ..... Full and half
- Step Rate 16-23,000/second
- Max Step Range ..... ± 8,388,607 steps
- Max Current ..... 1.2 amps/phase
- Voltage ..... 24V DC

Motor Leads ..... 4,6 or 8

Communications:
- Operating Mode ..... Single and party line
- Interface RS-232
- Baud Rate 9600
- Data Bits 8
- Stop Bits 1
- Parity ..... None
- Flow Control ..... XON/XOFF

I/O Connections:
- Limits ..... Limit A
- ..... Limit B
- Moving
- Go
- Soft Stop
- LogicCom

Memory:
- Non-Volatile ..... 2048 bytes

CATALOG NO.	STEPPING MOTOR CONTROLLER
7-2002	PCM-02 Stepping Motor Controller. Includes USB, I/O and SDMC cables. 110V AC, 60Hz
7-2003	PCM-02 Stepping Motor Controller. Includes USB, I/O and SDMC cables. 220V AC, 50HZ

DETECTOR MODULE

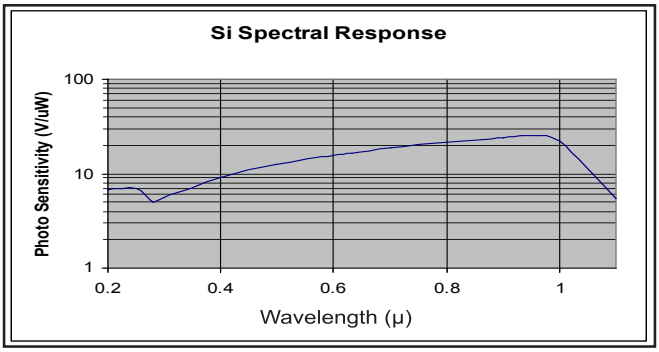
Optometrics' Silicon Detector Module is designed for direct mounting on Mini-Chrom monochromators* or in either aperture of either Sample Compartment (see pages 5 & 6). The modules are compact, low cost, simple to mount and require no user alignment. The silicon detector has a wide spectral response (200 nm to 1100 nm) with a peak response at approximately 900 nm. The detector covers the UV-VIS-NIR spectral region and is used extensively as a component in analytical and biomedical instrumentation, and in research, teaching and quality control. In addition to its wide spectral response, photocells have excellent linearity and signal-to-noise ratios.

The Detector Module consists of a mounted silicon photodiode, an integral low noise, high speed and exceptionally high stability operational amplifier and a slit assembly in a rugged housing. Mounting is facilitated by a pair of banana plugs on the slit assembly. When exposed to electromagnetic radiation of sufficient energy, photocells generate an electrical signal. The signal is the result of a photon induced difference in potential between the P and N layers within the photocell, i.e. the photovoltaic effect. The signal is proportional to the energy of the impinging radiation and varies as a function of wavelength. The Silicon Detector Module incorporates a photocell with low dark current, a fast response time, a quartz window and thin P-layer for an enhanced response to ultraviolet radiation.

A slide switch enables the selection of the time constant and "fast" for the recording (RS) spectrophotometer and computer data acquisition.

Power to the module (±15V DC) can be supplied with a wall mounted power supply (for 115V AC) or by an external power supply (for 230V AC).

* *See Optometrics' Monochromators brochure for details on models available.*



SPECIFICATIONS

Detector Module with Silicon Photodiode

Detector Type ..... UV enhanced Silicon
Spectral Range.....200 nm to 1.1 µ
Peak Response .....950 nm ± 50 nm
Photosensitive Area.....5.9 mm sq.
Output Signal.....0 to 14V DC full scale
"Slow" Time Constant .....50 mSec.
Cut-off Frequency..... 3 Hz
"Fast" Time Constant.....10 mSec.
Cut-off Frequency.....15 KHz
Radiant Sensitivity (A/W):.....0.1 @ 254 nm (Hg)
0.38 @ 632.8 nm (HeNe)
0.5 @ 930 nm (GaAs)

CATALOG NO.	DETECTOR MODULES
7-1302	Silicon photodiode with wall mounted power supply (115V AC TO ± 15V DC)
7-1303	Silicon photodiode with adapter cable for connection to a ± 15V DC power supply
7-1310	Silicon photodiode with wall mounted power supply (230V AC TO ± 15V DC)

CATALOG NO.	SLIT SIZE	DETECTOR ACCESSORIES	CATALOG NO.	SLIT SIZE
Slit assemblies for the Detectors when used with Mini-Chrom Monochromators				
7-1304	With 50 µ x 4 mm slit		7-1305	With 100 µ x 4 mm slit
7-1306	With 150 µ x 4 mm slit		7-1307	With 300 µ x 4 mm slit
7-1308	With 600 µ x 4 mm slit		7-1309	With 1 mm x 4 mm slit

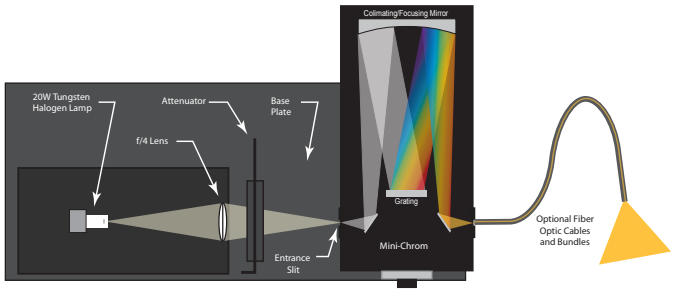
TUNABLE LIGHT SOURCES

Tunable light sources are used to maximize throughput in the visible region of the spectrum. They are used to study wavelength dependent chemical, biological, and physical changes or properties. The sources can also be used in color analysis and reflectivity measurements of products for aesthetic purposes.

The filament of a 20W tungsten halogen lamp is imaged so that it exactly fills the entrance slit of a Mini-Chrom monochromator. Surprisingly, as higher power lamps have larger filaments, most of the extra energy never makes it through the entrance slit and lamps with significantly higher wattage will not produce significantly higher throughput.

By turning the knob on the manual version, or using software control on the motorized version, the grating is rotated to allow only a few nm of light to pass through the fiber optic adapter or cable. Optometrics offers a wide range of grating choices for its tunable light sources to provide optimum band pass selectivity and throughput.

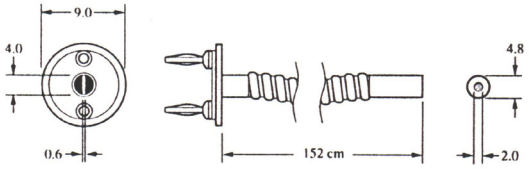
The lamp used in the TLS series has usable spectral energy between 360 nm and 2000 nm. However, no one grating can give adequate performance over this range.



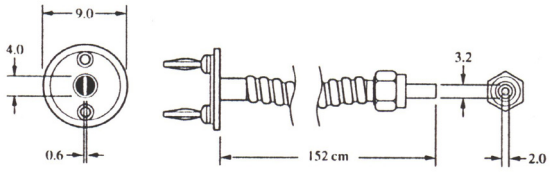
Optometrics offers versions optimized for the visible spectrum 360 nm to 800 nm and others for the near infrared. (see variable wavelength fiber optic modules.)

For most illumination applications, band passes of 5 nm or narrower are considered to be high resolution. Band passes of 10 nm or less are rarely needed in colorimetry or photochemistry.

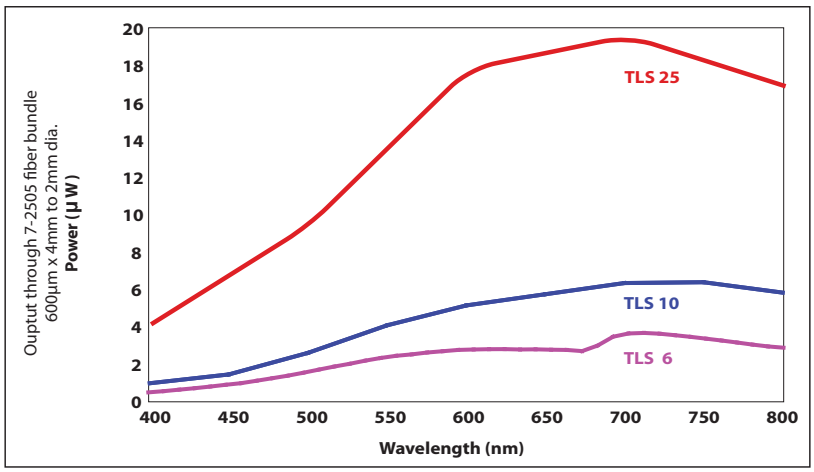
Optometrics offers three models; the TLS-6 with a 6 nm band pass, the TLS-10 with a 10 nm band pass and the TLS-25 with a 25 nm band pass when used with the standard 600 micron entrance slit and the optional 7-2505 or 7-2506 fiber optic cable. Power increases with band pass. Typically users will trade band pass for throughput, i.e. use the widest band pass possible that will not affect the quality of the measurement.



7-2505 Fiber Optic Cable with ferrule



7-2506 Fiber Optic Cable with SMA connector



Typical power output using the 7-2505 fiber bundle and a 600 µ entrance slit. The power and band pass will increase or decrease proportionally to the change in effective entrance and exit port apertures.

MODELS AND VERSIONS

The three models of the Tunable Light Sources, TLS-6, TLS-10, and TLS-25 are available in manual and computer controlled versions.

MANUAL VERSIONS INCLUDE:

- Digital monochromator with 600µ slit set
- Lamp module including variable aperture/shutter and power supply
- Aperture adapter SMA-905
- User manual

(Note: Manual versions cannot be upgraded to computer-controlled versions)

COMPUTER CONTROLLED VERSIONS INCLUDE:

- Scanning digital monochromator with 600µ slit set
- Lamp module including variable aperture/shutter
- Aperture adapter SMA-905
- User manual
- Control box (stepper motor controller and lamp power supply) with:
  - Power cord
  - Monochromator control cable
  - Lamp power cable
- Software CD

WAVELENGTH CONTROL SOFTWARE

The computer controlled TLS models come with a simple wavelength selection software that runs under Windows operating systems. It allows specific wavelength selection as well as the ability to scan over a spectral range with selectable wavelength increments.

Communications are via a USB 2.0 interface. Serial, RS-232C communications is optionally available at no additional cost.

SPECIFICATIONS

Monochromators

f/# 3.9
Focal length ..... 74 mm
Grating size ..... 20 mm x 20 mm
Entrance slit ..... 600 microns x 4 mm
Exit slit ..... 600 microns x 4 mm
SMA-905 connector included

Wavelength Accuracy
TLS-6 and TLS-10 ..... +/- 0.2%
TLS-25 ..... +/- 0.5%
Counter readability
TLS-6 and TLS-10 ..... 0.2 nm
TLS-25 ..... 0.8 nm
Stray light rejection ..... 10^{-3}

Gratings
TLS-06 ..... 1200 g/mm 400 nm blaze
TLS-10 ..... 900 g/mm 500 nm blaze
TLS-25 ..... 300 g/mm 500 nm blaze

Lamp

Type ..... Tungsten Halogen
Power 12V 20W
Color Temperature 32000K
Spectral range ..... 360 nm to 2000 nm
Power supply 12VDC 2A

Dimensions

Light source (on base plate)

L H W ..... 20.5 cm X 6.0 cm X 20.5 cm
Weight ..... 1.4 Kg

Control box for computerized models

L H W ..... 25.3 cm X 13.7 cm X 20.5 cm
Weight ..... 1.7 Kg

MODEL	BANDPASS (nm)	SPECTRAL (nm)	GRATING	P/N 110V	P/N 220V
Manual Versions					
TLS-6 M	6	360 to 800	1200 g/mm	9-8000	9-8001
TLS-10 M	10	360 to 800	900 g/mm	9-8010	9-8011
TLS-25 M	25	360 to 1000	300 g/mm	9-8020	9-8021
Computer Controlled Versions					
TLS-6 C	6	360 to 800	1200 g/mm	9-8100	9-8101
TLS-10 C	10	360 to 800	900 g/mm	9-8110	9-8111
TLS-25 C	25	360 to 1000	300 g/mm	9-8120	9-8121

Fiber Optic Cable Options	
7-2505	Fiber optic cable with ferrule
7-2506	Fiber optic cable with SMA connector

VARIABLE WAVELENGTH FIBER OPTIC MODULE

Configure your own Optometrics' Variable Wavelength Fiber Optic Module - a rugged, low cost compact instrument that produces monochromatic light out of a fiber optic bundle. Operation is as simple as turning on the lamp and rotating a dial until the desired wavelength appears on the four digit counter. The module can be used for remote spectroscopic sensing or in any application requiring monochromatic radiation that cannot be obtained easily by conventional methods.

* *See Optometrics' Monochromators brochure for details on models available.*

The module is comprised of a 20 watt tungsten halogen source, a digital or scanning digital monochromator and a five foot fiber optic bundle. The fiber bundle end is formed into a rectangular array that plugs directly into the monochromator, functionally replacing the exit slit. It is supplied with a 600 micron slit assembly for use on the entrance side. The other end terminates in a conventional circular bundle. Choose either the Digital Mini-Chrom or the Scanning Digital Mini-Chrom monochromator* and a Stepping Motor Controller (see page 8).

STEP 1 Choose Your Monochromator (Automated or Manual)

AUTOMATED

SCANNING DIGITAL MINI-CHROM		
CATALOG NO.	MODEL	WAVELENGTH RANGE
6-0503	SDMC1-03	300 nm - 800 nm
6-0504	SDMC1-04	500 nm - 1.2 µ
6-0505	SDMC1-05	750 nm - 1.7 µ
6-0507	SDMC1-06	750 nm - 1.7 µ
6-0506	SDMC1-05G	850 nm - 2.2 µ
6-0508	SDMC1-06G	850 nm - 2.2 µ

MANUAL

DIGITAL MINI-CHROM		
CATALOG NO.	MODEL	WAVELENGTH RANGE
6-0403	DMC1-03	300 nm - 800 nm
6-0404	DMC1-04	500 nm - 1.2 µ
6-0405	DMC1-05	750 nm - 1.7 µ
6-0406	DMC1-05G	750 nm - 1.7 µ
6-0408	DMC1-06	850 nm - 2.2 µ
6-0409	DMC1-06G	850 nm - 2.2 µ

STEP 2 Choose Your Light Source Voltage (340 nm - 3 µ) *(see page 4)*

7-1000 Options:
- A - 105-125V
- B - 210-225V
- C - No Power Supply
  (For use with Motor Controller, below)

Buy 2	Component Manual Modules, Deduct 5% from total cost
Buy 3	Component Manual or Automated Modules, Deduct 7.5% from total cost
Buy 4	Component Automated Modules, Deduct 10% from total cost

STEP 3 For Automated Modules, choose your Stepping Motor Controller

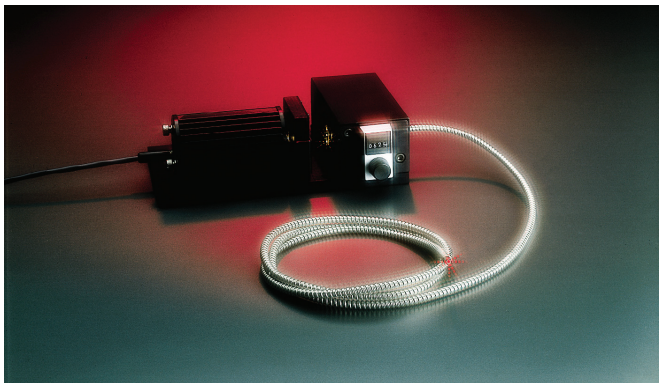
(see page 8)

For 105-125 V, 7-2002
For 210-225 V, 7-2003

STEP 4 For Non-UV Models, choose your Fiber Optic Cable

(see pages 10-11 of the Monocrhomators brochure)

Without SMA Connector 7-2505
With SMA Connector 7-2506



Manual version with optional fiber optic cable

Notes

Notes

Optometrics Corporation

Wavelength Selection Solutions

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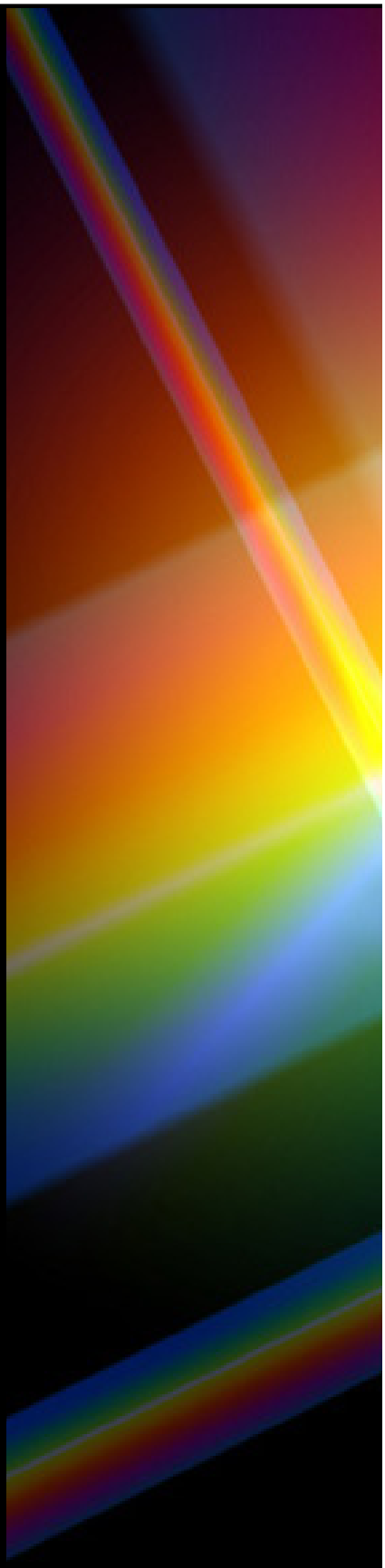

Systems & Accessories 2012 Catalog

Quantity discounts available and OEM inquiries welcome.

For more information, contact Optometrics Corporation at sales@optometrics.com.